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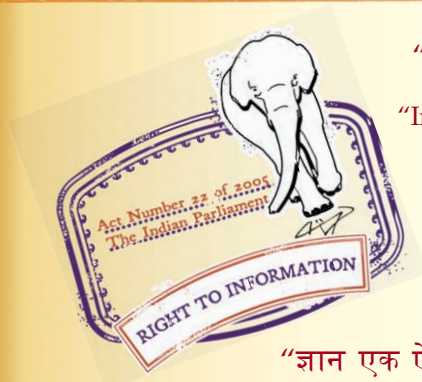
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IS 7520 (1974): Corrosion resistant high silicon iron castings [MTD 6: Pig iron and Cast Iron]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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(Reaffirmed 2005)

Indian Standard
**SPECIFICATION FOR
CORROSION-RESISTANT HIGH SILICON
IRON CASTINGS**

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SPECIFICATION FOR CORROSION-RESISTANT HIGH SILICON IRON CASTINGS

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Indian Standard

SPECIFICATION FOR CORROSION-RESISTANT HIGH SILICON IRON CASTINGS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 December 1974, after the draft finalized by the Cast Iron and Malleable Cast Iron Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 High silicon cast irons are hard, brittle and except for grinding unmachinable. Their high hardness enables them to withstand the combined effects of corrosion and abrasion, but their low strength and brittle nature make them especially susceptible to thermal shock, and appropriate steps shall be taken in plants dealing with hot liquids to see that steep temperature gradient does not occur. The engineering properties of the high silicon cast irons lie closer to stoneware than to the usual metals or alloys.

0.3 This standard covers high silicon iron castings for use where high corrosive media are to be handled, such as in the chemical, petrochemical, textile and other similar industries. Silicon iron is also used for the manufacture of anodes used in cathodic protection.

0.4 Silica-like oxide film is formed on these irons which offers resistance to corrosion. This film, which is really a corrosion product, is formed fairly soon after the metal is placed in service. Broadly speaking, the iron atoms are leached out of silico-ferrite lattice, and the surface network of silicon atoms which remains is oxidized to form a protective silicon-oxygen film which effectively arrests further corrosion in many media. Halide and sulphide ions, particularly in acid solutions, are inimical to the development of this protective film; whilst hydrofluoric acid, of course, dissolves it.

0.5 While formulating this standard the manufacturing and trade practices followed in the country in this field have been kept in view. In preparing this standard assistance has been derived from the following publications:

BS 1591 : Specification for corrosion resisting high silicon iron castings (*under revision*). British Standards Institution.

ASTM Designation : A518-64 Specification for corrosion-resistant high silicon cast iron. American Society for Testing and Materials.

0.6 This standard contains clauses which require the purchaser to specify his requirements, if necessary, while placing an order. These clauses are **7.2, 10.1, 11.1 and 13.2.**

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements for corrosion-resistant high silicon iron castings for chemical engineering purposes and material used for cathodic protection anodes.

2. SUPPLY OF MATERIAL

2.1 General requirements relating to the supply of corrosion-resistant high silicon iron castings shall be as laid down in IS : 1387-1967†.

3. MANUFACTURE

3.1 The castings shall be made by any suitable melting process.

4. GRADES

4.1 There shall be three grades of corrosion-resistant high silicon iron castings, namely, Grade 1, Grade 2 and Grade 3.

5. CHEMICAL COMPOSITION

5.1 The ladle analysis of silicon iron alloy, when made in accordance with IS : 228-1959‡, shall be as given in Table 1.

6. CHECK ANALYSIS

6.1 If specified by the purchaser check analysis shall be made from the risers or runners of the casting. The chemical composition thus determined shall conform to the requirements specified in Table 1.

*Rules for rounding off numerical values (*revised*).

†General requirements for the supply of metallurgical materials (*first revision*).

‡Methods of chemical analysis of pig iron, cast iron and plain carbon and low-alloy steels (*revised*).

**TABLE 1 CHEMICAL COMPOSITION OF CORROSION-RESISTANT
HIGH SILICON IRON CASTINGS, PERCENT**

(Clauses 5.1 and 6.1)

CONSTITUENT	GRADE 1	GRADE 2	GRADE 3
Carbon, <i>Max</i>	1.2	1.0	0.8
Silicon	10.00-12.00	14.00-16.00	16.00-18.00
Manganese, <i>Max</i>	0.5	0.5	0.5
Phosphorus, <i>Max</i>	0.25	0.25	0.25
Sulphur, <i>Max</i>	0.1	0.1	0.1

NOTE — Grade 2 is recommended for general applications involving corrosion resistance. Grade 1 has greater tensile strength than Grade 2 but a reduced corrosion resistance. Grade 3 is recommended where greater corrosion resistance is required at the expense of tensile strength.

7. WORKMANSHIP AND FINISH

7.1 The castings shall be accurately moulded in accordance with the pattern or working drawings supplied by the purchaser, with the addition of such letters, figures and marks as may be specified.

7.2 The purchaser shall specify tolerances on all important dimensions. On other dimensions, normal trade tolerances in the as-cast condition, subject to mutual agreement between the purchaser and the manufacturer, shall be applicable.

8. PATTERN EQUIPMENT

8.1 Wood, metal and/or plastic pattern equipment, allowing a shrinkage rate of 1 in 64, shall be used.

9. FREEDOM FROM DEFECTS

9.1 All castings shall be sound, clean and free from harmful defects. In the event of any casting proving defective from foundry causes in the course of preparation, machining/grinding or erection, such castings shall be rejected notwithstanding any previous stipulation of satisfactory testing and/or inspection.

NOTE — Massive high silicon iron castings characteristically possess a macro-porosity which may be noticeable on ground or machined surfaces. This porosity is essential for proper serviceability of the part and is cause for rejection only if inter-connected. Pressure testing (*see 11*) shall determine the acceptability of casting showing the visible macroporosity.

10. HEAT TREATMENT

10.1 If so desired by the purchaser, the castings shall be supplied in stress-relieved condition. The heat-treatment procedure, when required, shall be as given in Appendix A.

10.2 Test pieces shall also be heat-treated alongwith the casting they represent.

11. PRESSURE TESTING

11.1 If specified by the purchaser on enquiry or order, casting shall be subjected to an air or hydraulic test. The pressure and medium shall be specified by the purchaser on the enquiry or order.

11.2 Casting showing porosity under this test shall be rejected.

12. TEST SPECIMENS

12.1 All analytical test samples shall be permanently marked by heat number from which they were poured.

13. MARKING

13.1 Where practicable, each casting shall be legibly marked with an identification mark by which it can be traced to the melt and the batch of heat treatment, where applicable, from which it was made.

13.2 By agreement between the purchaser and the manufacturer, castings complying with the requirements of this standard may, after inspection, be legibly marked with an acceptance mark.

13.2.1 The castings may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(Clause 10.1)

PROCEDURE FOR HEAT TREATMENT

A-1. The castings shall be stripped from the mould while hot and, as soon as possible after solidification and with the least possible delay, the hot castings shall be charged direct to a furnace previously heated to a temperature of approximately 600°C and maintained at that temperature during the period of charging the castings. When the furnace is finally charged, the castings shall be uniformly heated to a temperature of not less than 750°C and not more than 850°C. They shall be soaked at this temperature for a period varying from two hours for small castings of simple form and maximum thickness of 18 mm up to 8 hours, according to section and design, for heavy castings of intricate design and varying section. After soaking, the castings shall be slowly cooled in the furnace and not removed until the temperature has fallen below 300°C.



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